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DETERMINATION OF AVERAGE WORKING TIME IN FINLAND

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Abstract

The paper investigates the determination of average working time in Finland. The issue is studied by using data from six industries from 1960 to 1996. The main empirical result is that both an increase in labour productivity and a widening of tax wedge have contributed to a decline in average working time in Finland. These observations are consistent with the predictions of theoretical model.

Keywords: working hours, work-sharing, tax wedge

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Tiivistelmä

Tutkimuksessa tarkastellaan keskimääräisen työajan määräytymistä Suomessa. Tarkastelussa käytetään kuuden toimialan paneeliaineistoa vuosilta 1960–1996. Tulosten mukaan se-kä työn tuottavuuden kasvu että verokiilan leveneminen ovat johtaneet keskimääräisen työajan lyhenemiseen Suomessa. Tulokset ovat sopusoinnussa teoreettisen tarkastelun kanssa.

1. Introduction

Europe's high unemployment trap has generated a great number of ambitious plans to solve the dilemma. One of them is known as "work-sharing" (see, e. g. Bosch 1998). The idea has also been put in practice in many OECD countries, where the average annual working time has been reduced either by contracts or by legislation[1]. The issue of work-sharing is debated in Europe, but a little is known about the very economic factors that have contributed to a decline in average working time during the past few decades.

A standard microeconomic theory of individual labour supply suggests that labour supply and hence average working hours should decline when real incomes rise[2]. In reality individuals tend to supply the prevailing number of standard hours. The standard hours are not decided on individual or firm basis but instead collectively, either by binding collective agreements or by legislation. However, it can be argued that pressures for such agreements will grow when the individual demand for leisure increases.

In this paper we use a simple model of individual labour supply to capture the effects of productivity growth and labour taxation. It is assumed that the real labour cost equals labour productivity and that the desired leisure increases with total incomes. There is a public sector in the model which produces public goods and gives income transfers to the households. The public sector has a binding budget contraint and hence it has to finance it's expenditure by taxing labour input. The effects of the payroll taxes and income taxes are identical in the model.

The aim of this paper is to elaborate the factors that has contributed to a decline in average working time at the aggregate level in the case of Finland[3]. The study is conducted through the use of a panel data set consisting of six industries, from 1960 to 1996. The main result of this paper is that both an increase in labour productivity and a widening of tax wedge have contributed to a decline in average working time. The paper consists of five sections. The next section presents a simple model of labour demand and wage setting which tries to

[1] In German manufacturing industries a 35-hour week was adopted in the 1980's as a result of negotiations between unions and employers. In France, a 35-hour week will be forced via legislation at the beginning of the 21st century in order to alleviate the high unemployment.

[2] See, e. g. Pencavel (1986).

[3] This paper is a complementary one to our earlier paper on work-sharing (see, Böckerman & Kiander 1998).

illuminate some basic feedback mechanisms between average working time, productivity and tax wedge. The third section contains a short description of the data set, and provides a justification for the choice of the variables. The section fourth reports the empirical results from a number of panel data estimations. The last section concludes with a few remarks.

2. The model

Consider a simple model of individual labour supply. We assume first that firms are on their labour demand curves, and hence the labour cost is equal to the marginal product of labour, or

(1) $$(1+s)W = Q\,,$$

where *W* is the hourly wage and payroll tax is denoted by *s.* For simplicity we assume that in long run the marginal product of labour (*Q*) is equal to the average product of labour. Hence *Q* can be interpreted as average labour productivity, which increases with time-dependent technical progress, *A*(*t*), and capital-labour ratio (*K*/*N*):

(2) $$Q = A(t)F\left(\frac{K}{N}\right).$$

For simplicity we take the capital stock here as an exogenous constant. The workers are assumed to get utility from consumption of goods and of leisure. For simplicity we assume that there is no saving. Hence the utility function of the workers is given by

(3) $$V = V(C, L) = V[WH(1-t) + G, T - H]\,,$$

where income tax rate is denoted by *t*. The income consists of after-tax labour income and the money-value of a bundle of public goods and income transfers provided by the government (*G*). The number of hours worked is *H*, and *T* is the number of total hours. The public expenditure is determined by a political process which is treated as exogenous.

Substituting equation (1) into equation (3) yields

(4) $$V = V\left(\frac{QH}{\Theta} + G, T - H\right)$$

where $\Theta = \frac{1+s}{1-t} \geq 1$ is a measure of tax wedge.

The government covers its expenditure by taxing employers and employees. Hence it's budget constraint is given by

(5) $$G = (s+t)WH = \frac{\Theta - 1}{\Theta} QH = \frac{\Theta - 1}{\Theta} Y,$$

where *Y* is the aggregate output per capita.

Let us use the following logarithmic specification of the utility function to derive the comparative statics results:

(6) $$V = \log\left(\frac{QH}{\Theta} + G\right) + B(QH)\log(T - H),$$

where *B* is the weight of leisure. We assume that *B* is a increasing function of aggregate output:

(7) $$B = B(QH), \quad B' > 0,$$

This means that when people become richer, they will put more weight on leisure in their individual utility functions.

The optimal labour supply can now be derived from the first-order condition of utility maximation:

(8) $$\frac{\P V}{\P H} = B'Q(-\log L) + \frac{Q}{QH + G\Theta} - \frac{B}{T - H} = 0$$

The effect of increased productivity on individual working time can be derived by differentiating the first-order condition:

(9) $$\frac{\P^2 V}{\P H \P Q} = -B'\log L - B''H\log L - \frac{B'H}{T-H} + \frac{\Theta(G - G_\Theta Q)}{(QH + G\Theta)^2}$$

$$= -B'\log L - B''H\log L - \frac{B'H}{T-H} < 0$$

since $G - G_\Theta Q = 0$. Whether this expression is negative or positive is an empirical question. Theoretically, it depends on the sign and the size of B''. However, it is clear that the average productivity has a negative effect on working time when the total output per worker is sufficiently low.

Similarily, it is straightforward to show that an increase in tax wedge also reduces the working hours:

(10) $$\frac{\P^2 V}{\P H \P \Theta} = -\frac{(G + \Theta G_\Theta)}{(QH + G\Theta)^2} < 0\,.$$

The size of this effect increases with the size of public sector.

Remembering that the average productivity consists of technical progress and capital intensity, one can write:

(11) $$H = H\left(A(t), \frac{K}{N}, \Theta \right);$$

$$\frac{\P H}{\P A(t)}, \frac{\P H}{\P (K / N)} < 0 \ \ for \ QH < Q^* H^* \ and \ \ \frac{\P H}{\P \Theta} < 0 \ \ for \ all \ \Theta .$$

Or in words, the equilibrium working time depends on productivity and tax wedge.

3. The data

The determination of average working time in Finland is studied by dividing the economy into six main sectors. The sectors are agriculture, forestry and logging (SIC[4]: A-B), manufacturing (SIC95: C-E), construction (SIC95:F), wholesale and retail trade (SIC95: G), transportation (SIC95: I) and public activities (SIC95: L-N). The study is based on the yearly observations from 1960 to 1996.

A short description and the source of the variables is provided in Appendix 1. Through the use of a panel data estimation, average working time is explained by labour productivity, tax wedge and gross capital formation. The decline in hours per worker is evident in the case of all sectors from 1960 to 1996. However, it is important to note that there also exists an interesting variation in the behaviour of hours per worker across the sectors. This variation is naturally masked in the aggregate data. An important feature of the data set is that the sectoral variation in a tax wedge variable is totally generated by one component of the tax wedge, namely by "social security contributions / wages". The reported results are robust with respect to this specification.

The study also contains a potential weakness, because it is not possible to get a disaggregated data on standard hours and overtime covering the whole period from 1960 to 1996. This means that we have to use data on *actual* average working hours[5]. However, this is not a major problem, because – as noted by Holm and Kiander (1993) – in the long run the time path of actual working hours closely follows that of standard hours, at least in the case of Finnish manufacturing[6]. Fig. 1 illustrates the evolution of standard hours and actual hours per worker in the Finnish manufacturing industry from 1960 to 1996. The permanent gap between standard hours and actual hours per worker is mainly due to sickness and parental leaves. The rapid fall in actual hours per worker during the great slump of the early 1990s is a consequence of sweeping layoffs. The relationship of standard hours and actual

[4] SIC refers to Standard Industry Classification.

[5] In other words, we use actual average working hours as a proxy variable for standard hours.

[6] However, an application of Johansen's (1995) procedure reveals that the log of standard hours and the log of actual working hours per worker in Finnish manufacturing are not cointegrated variables. This result is not generated purely by the observations from the great slump of the early 1990s. Jacobson and Ohlsson (1996, 15–17) have investigated the long run relationship of standard hours and actual hours per worker in the case of the Swedish private sector from 1963:1–1993:4. They concluded that the log of standard hours and the log of actual hours per worker are cointegrated variables.

hours per worker in other sectors of economy is not known, but there is no particular reason to think that firms could use overtime as a long-term arrangement in the other sectors of the economy. The reason is that a permanent increase in overtime is due to the high overtime premia a far too expensive way to adjust labour input from the point of view of firms.

4. The results

It is convenient to set up a simple fixed effects model in order to investigate the determination of average working time in Finland, as follows:

(12) $$\text{Log}(WH/NI)_{it} = \nu_i + \mu_t + b_1\text{Log}(Q/NI)_{it} + b_2 TAXWEDGE_{it} + b_3 \text{Log}K_{it} + e_{it}$$

where WH stands for performed working hours, NI for employment, Q for value added in basic values, K for gross capital formation and ν_i is an industry factor. It captures all the industry-specific characteristics (such as the labour-intensivity of production) that remain stable over time. μ_t includes all factors that are common to industries and tend to vary over time (such as interest rate hikes, recessions and the changes in taxation etc.).

Table 1. The estimation results of fixed effects model for average working time in Finland, from 1960 to 1996 (dependent variable: average working time $\text{Log}(WH/NI)_{it}$).

Independent variables	Coefficient (and t-value)
Log(Q/NI)	-0.04 (-3.07)
TAXWEDGE	-0.33 (-6.81)
LogK	-0.002 (-0.50)
R^2	0.93
F(7, 208)	320.40

The estimation results are reported in Table 1. The main result is that an increase in labour productivity and a widening of tax wedge have both contributed to a decline in average working time in Finland[7]. These observations are consistent with the earlier theoretical elaboration. The results are also in line with common sense. This is due to the fact that a rise in labour productivity over time means that people get richer and as a consequence they demand more leisure. Reductions in working time are one way of distributing increased prosperity. On the other hand, a widening of tax wedge over time has meant that it is for workers more attractive to take the fruits of increased productivity as an increase in leisure. As a crude conjecture, one might conclude that capital deepening could in principle via various substitutions effects led to a decline in average working time. However, the estimation results don't support this view in the case of Finland.

[7] The results are almost identical in the case of random effects model with respect to reported ones.

5. Concluding remarks

The determination of average working time in Finland was studied by using data from six industries from 1960 to 1996. The main result is that both an increase in labour productivity and a widening of tax wedge have contributed to a decline in average working time in Finland. These observations are consistent with the predictions of theoretical model.

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Appendix 1. The description of the variables and their sources. “Direct taxes / household income” (TAXW1) and “Indirect taxes / consumption expenditures” (TAXW2) are *not* sectoral variables. The sectoral variation in tax wedge (TAXWEDGE[8] = TAXW1 + TAXW2 + TAXW3) is totally generated by “social security contributions / wages” (TAXW3).

Variable	Source
Value added in basic values (Q)	National Accounts
Direct taxes / household income (TAXW1) Indirect taxes / consumption expenditures (TAXW2) Social security contributions / wages (TAXW3) TAXWEDGE = TAXW1 + TAXW2 + TAXW3	National Accounts
Performed working hours (WH)	National Accounts
Employed persons (NI)	National Accounts
Gross capital formation (K)	National Accounts

[8] Layard, Nickell and Jackman (1991) prefer this specification.

Fig. 1. An evolution of employment (thousand persons, left-hand scale), and standard hours and annual actual average working hours (right-hand scale) in manufacturing from 1960 to 1996 (Source: The Confederation of Finnish Industry and Employers & National Accounts).